

Notice of Allowability

Application No.

09/781,035

Examiner

Tiffany A. Fetzner

Applicant(s)

MADARASZ ET AL.

Art Unit

2859

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 11/14/2005 and the telephonic interview of January 18th 2006.
2. ☒ The allowed claim(s) is/are Examiner amended claims 1-14, and new claims 15-22 from the 11/14/2005 response.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☒ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☒ hereto or 2) ☒ to Paper No./Mail Date 01/23/2006.
 - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 01/23/2006.Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 01/23/2006.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with **Attorney David P. Krivoshik Reg. No. 39,258** on January 18th 2006 along with authorization to charge any necessary fees to applicant's deposit account. No fees are believed to be necessary at this time.
3. The application has been amended as follows:

A) Replace claim 1 of the November 14th 2005 amendment and response with the following **Examiner amended claim 1**:

Claim 1 ---A method for in vivo parameter estimates in magnetic resonance imaging comprising the following steps:

accessing motion-intentional parameterized magnetic resonance imaging data;
providing a magnetic resonance imaging dynamic model function; and
using conditional probabilities based on Bayes' Theorem to resolve the motion-intentional parameterized magnetic **resonance** imaging data with respect to the magnetic resonance imaging **dynamic** model for flow across a vessel. ---

B) Replace claim 2 of the November 14th 2005 amendment and response with the following **Examiner amended claim 2**:

Claim 2 ---The method as recited in **claim 1**, further comprising the application of Bayes' Theorem to **the** method of maximum likelihood. ---

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C) Replace claim 3 of the November 14th 2005 amendment and response with the following **Examiner amended claim 3**:

Claim 3 ---The method as recited in **claim 1** further comprising the application of Bayes' Theorem to **the** maximum a posteriori (MAP) method. ---

D) Replace claim 4 of the November 14th 2005 amendment and response with the following **Examiner amended claim 4**:

Claim 4 --- The method as recited in **claim 1**, further comprising the step of comparing probabilities for at least two **different** noise models and determining which noise model of the at least two **different** noise models is better. ---

E) Replace claim 5 of the November 14th 2005 amendment and response with the following **Examiner amended claim 5**:

Claim 5 --- The method as recited in **claim 4**, wherein the magnetic resonance imaging data is examined to determine which noise model of the at least two **different** noise models is better. ---

F) Replace claim 6 of the November 14th 2005 amendment and response with the following **Examiner amended claim 6**:

Claim 6 --- A system **configured** for *in vivo flow* parameter estimates in magnetic resonance imaging **comprising**:

an interface **configured** for accessing *motion-intentional parameterized* magnetic resonance imaging data; and

a digital processor **configured** for using conditional probabilities based on Bayes' Theorem **in order** to resolve the **accessed** magnetic **resonance** imaging data with respect to a *dynamic* magnetic resonance imaging model **of flow across a vessel**. ---

G) **Replace claim 7** of the November 14th 2005 amendment and response with the following **Examiner amended claim 7**:

Claim 7 ---The system as recited in **claim 6**, wherein the digital processor applies Bayes' Theorem to **the** method of maximum likelihood. ---

H) **Replace claim 8** of the November 14th 2005 amendment and response with the following **Examiner amended claim 8**:

Claim 8 ---The system as recited in **claim 6**, wherein the digital processor applies Bayes' Theorem to **the** maximum a posteriori (MAP) method. ---

I) **Replace claim 9** of the November 14th 2005 amendment and response with the following **Examiner amended claim 9**:

Claim 9 --- The system as recited in **claim 6**, wherein the digital processor compares probabilities for at least two **different** noise models and determines which noise model of the at least two **different** noise models is better. ---

J) Replace claim 10 of the November 14th 2005 amendment and response with the following **Examiner amended claim 10**:

Claim 10 --- The system as recited in **claim 9**, wherein the magnetic resonance imaging data is examined **in order** to determine which noise model of the at least two **different** noise models is better. ---

K) Replace claim 11 of the November 14th 2005 amendment and response with the following **Examiner amended claim 11**:

Claim 11 --- An improved magnetic resonance imaging device **configured** for *in vivo* parameter estimates comprises:

a magnetic resonance imaging device having a digital processor;

wherein the digital processor uses conditional probabilities based on Bayes' Theorem **in order** to resolve *in vivo motion-intentional parameterized* magnetic **resonance** imaging data with respect to a *dynamic* magnetic resonance imaging model **of blood flow velocity, blood flow acceleration, blood flow turbulence, or blood flow phase shifts due to flow gradients, across a vessel**. ---

L) Replace claim 12 of the November 14th 2005 amendment and response with the following **Examiner amended claim 12**:

Claim 12 ---The improved magnetic resonance imaging device as recited in **claim 11** wherein the digital processor applies Bayes' Theorem to **the** method of maximum likelihood. ---

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M) Replace claim 13 of the November 14th 2005 amendment and response with the following **Examiner amended claim 13**:

Claim 13 ---The improved magnetic resonance imaging device as recited in **claim 11** wherein the digital processor applies Bayes' Theorem to **the** maximum a posteriori (MAP) method. ---

N) Replace claim 14 of the November 14th 2005 amendment and response with the following **Examiner amended claim 14**:

Claim 14 ---The improved magnetic resonance imaging device as recited in **claim 11** wherein the digital processor compares probabilities for at least two **different** noise models and determines which noise model of the at least two **different** noise models is better. ---

O) Replace New claims 15-22 of the November 14th 2005 amendment and response with the following **Examiner amended claims 15-22**:

Claim 15 --- The method as recited in **claim 1**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow velocity. ---

Claim 16 --- The method as recited in **claim 1**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow acceleration. ---

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Claim 17 --- The method as recited in **claim 1**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow turbulence.

Claim 18 --- The method as recited in **claim 1**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow phase shifts due to flow gradients. ---

Claim 19 --- The system as recited in **claim 6**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow velocity. ---

Claim 20 --- The system as recited in **claim 6**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow acceleration. ---

Claim 21 --- The system as recited in **claim 6**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow turbulence.

Claim 22 --- The system as recited in **claim 6**, wherein the motion-intentional parameterized magnetic **resonance** imaging data corresponds to blood flow phase shifts due to flow gradients. ---

The following is an examiner's statement of **Reasons for Allowance**:

4. With respect to **Examiner amended independent claims 1, 6, and 11**: These claims are considered to be allowable over the prior art of record by the examiner

because the prior art of record does not disclose or suggest an MRI system, device or method comprising ***in vivo* flow parameter estimates in MRI** comprising "accessing **motion-intentional parameterized magnetic resonance imaging data**; providing a **magnetic resonance imaging dynamic model function**; and using **conditional probabilities based on Bayes' Theorem** to resolve the motion-intentional parameterized magnetic resonance imaging data with respect to **the magnetic resonance imaging dynamic model for flow across a vessel**," in combination with the remaining limitations of each of the corresponding system, device and method claims. It is the combination of all of the claim limitations taken as a whole that constitutes both the novelty and non-obviousness of applicant's claims.

5. The **prior art of record** fails to apply applicant's **dynamic (i.e. changing) MRI model function** to the **conditional probabilities based on Bayes' Theorem** to **resolve *in vivo* flow parameter estimates of the motion-intentional parameterized magnetic resonance imaging data for flow across a vessel**.

6. **Claims 2-5, 7-10, and 12-22** are considered to be allowable by the examiner because they each depend from an allowable independent claim.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Examiner's Comment

Specification

8. The objections to the disclosure from the May 3rd 2005 office action are **rescinded** in view of applicant's amendments to the specification, found on pages 2, 3, and 4 of the November 14th 2005 response.

Drawings

9. The objections to the drawings from the May 3rd 2005 office action are **rescinded** in view of applicant's amendments to the specification, found on pages 2, 3, and 4 of the November 14th 2005 response and the amendments made to figure 1, with the corrected figure 1 submitted on November 14th 2005 as well.

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10. A New set of corrected drawings are required in this application because the official draftsman has objected to the drawings submitted on **02/09/2001** and **11/14/2005**. A **complete set of NEW FORMAL DRAWINGS** including any and all examiner approved drawing changes, that have occurred during this examination are now required. [See the attached PTO 948 form of the Official Draftsman's Review.]

11. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Prior Art of Record

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) G. Larry **Bretthorst**, article "Bayesian Analysis. III. *, Applications to NMR Signal Detection, Model Selection, and Parameter Estimation **", Journal of Magnetic Resonance, Vol. 88, pp. 571-595, 1990. [**Applies to all claims** but lacks the actual hardware used in an MRI system including a digital signal processor. **The nonstationary frequencies of page 576 suggest a "flow estimation of parameters" resolved by Bayes' theorem.** Since the entire reference is the application of **Bayes' theorem** to NMR / MRI.]

B) ***Hibbard** US patent 6,249,594 B1 issued June 19th 2001, filed May 29th 1998.

C) ***Puetter et al.**, US patent 5,912,993 issued June 15th 1999, filed June 8th 1993.

D) **Puetter et al.**, US patent 6,353,688 B1 issued March 2nd 2002; filed June 14th 1999. CIP of the Applied **Puetter et al.**, US patent 5,912,993 above.

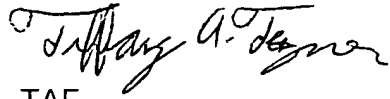
Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

14. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax**

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phone number for the organization where this application or proceeding is assigned is
(571) 273-8300.



TAF

January 23, 2006



Diego Gutierrez
Supervisory Patent Examiner
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